

Serial No. 09/975,682 (Atty. Docket No. Huang 12)  
Amendment dated June 30, 2005  
Reply of Office Action of March 30, 2005

### **AMENDMENT TO THE CLAIMS**

**Please consider the claims as follows:**

**1. (Currently Amended)** Method for reducing cross-talk in a communications system comprising a plurality of transmitters for transmitting encoded data signals via respective communications channels, said method comprising the steps of:

processing a first encoded data signal according to at least one pre-coding matrix to produce a first pre-coded signal, each of said at least one pre-coding ~~matrices~~ matrix having associated with it a respective encoded data signal;

communicating said first pre-coded signal to a respective first communication channel; and

adapting said at least one pre-coding ~~matrices~~ matrix in response to an impairment indicative signal;

said processing tending to offset channel impairments within said first communications channel.

**2. (Currently Amended)** The method of claim 1, further comprising the steps of:

receiving said first pre-coded signal from said first communications channel; and

generating said impairment indicative signal in response to a determination of a channel impairment level of said first communications channel.

**3. (Original)** The method of claim 2, wherein said impairment indicative signal is determined according to a least mean square (LMS) algorithm.

**4. (Currently Amended)** The method of claim 1, wherein signals propagated via each of said communications channels comprise a respective set of in-phase (I) and quadrature (Q) signals forming carrierless amplitude and phase (CAP) modulated signals.

**5. (Currently Amended)** The method of claim 1, wherein signals propagated via each of said communications channels comprise a respective set of in-phase (I) and quadrature (Q) signals forming quadrature amplitude modulated (QAM) signals.

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**6. (Currently Amended)** The method of claim 1, further comprising the step of:  
prior to processing said first encoded data signal, selecting, as initial parameters  
of said at least one pre-coding matrix, a set of parameters tending to offset said channel  
impairment impairments of said first communications channel, said step of selecting  
initial parameters comprising the steps of:

~~determining initial parameters of said at least one pre-coding matrix prior~~  
~~to processing said first encoded data signal, said initial parameters of said at~~  
~~least one pre-coding matrix determined according to the steps of:~~

propagating a pre-defined training sequence via said first communications  
channel;

receiving said pre-defined training sequence from said first  
communications channel; and

determining initial parameters of said at least one pre-coding matrix, using  
said received pre-defined training sequence, related to a channel impairment  
impairments of said first communications channel.

**7. (Currently Amended)** The method of claim 4, wherein said step of adapting  
comprises the steps of:

increasing an amplitude level of said at least one respective set of said I and Q  
signals; and

repeating said steps of processing and communicating until said an impairment  
indicative signal level is less than a threshold level.

**8. (Original)** The method of claim 1, wherein said communications system comprises N  
transmitters, where N is an integer, each of said N transmitters performing said steps of  
processing, communicating and adapting using respective encoded data signals.

**9. (Original)** The method of claim 8, wherein each of said N transmitters processes an  
encoded data signal according to N-1 pre-coding matrices, each of said N-1 pre-coding

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matrices being associated with a respective encoded data signal from the other transmitters.

**10. (Original)** The method of claim 8, wherein each of said N transmitters processes an encoded data signal according to N pre-coding matrices, each of said N pre-coding matrices being associated with a respective encoded data signal from each of the N transmitters.

**11. (Currently Amended)** The method of claim 8, wherein:

each of said N transmitters performs the step of selecting initial parameters for respective at least one pre-coding matrices prior to processing a respective encoded data signal, said selected initial tending to offset channel impairment impairments of said respective communications channels, said step of selecting initial parameters comprising the steps of:

~~determining initial parameters of said at least one pre-coding matrix prior to processing a respective encoded data signal, said initial parameters of said at least one pre-coding matrix determined according to the steps of:~~

propagating a pre-defined training sequence via a respective communications channel;

receiving said pre-defined training sequence from said respective communications channel; and

determining initial parameters of said at least one pre-coding matrix, using said received pre-defined training sequence, a said channel impairment impairments of said respective communications channel.

**12. (Original)** The method of claim 6, further comprising the step of training an equalizer to reduce channel-specific impairments from said received pre-defined training sequence prior to selecting said initial matrix parameters.

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**13. (Original)** The method of claim 11, further comprising the step of training an equalizer to reduce channel-specific impairments from said received pre-defined training sequence prior to selecting said initial matrix parameters.

**14. (Currently Amended)** Method for reducing cross-talk in a communications system comprising a plurality of communications channels, each communications channel propagating a respective set of in-phase (I) and quadrature (Q) signals, said method comprising the steps of:

- (a) processing at least one set of I and Q signals according to a respective pre-coding matrix to produce respective pre-coded I and Q signals;
- (b) communicating said at least one set of pre-coded I and Q signals via a respective communication channel;
- (c) receiving, for each communicated set of pre-coded I and Q signals, difference error data indicative of differences between transmitted and transmission errors in received signals;
- (d) adapting respective pre-coding matrices in response to respective received difference data; and
- (e) repeating steps (a) through (d) until said difference error data associated with said at least one set of I and Q signals is less than a threshold difference level.

**15. (Currently Amended)** The method of claim 14, wherein said error data indicative of differences between transmitted and received signals comprises mean square error data.

**16. (Currently Amended)** The method of claim 14, wherein said at least one set of in-phase (I) and quadrature (Q) signals form carrierless amplitude and phase (CAP) modulated signals.

**17. (Currently Amended)** The method of claim 14, wherein said at least one set of in-phase (I) and quadrature (Q) signals form quadrature amplitude modulated (QAM) signals.

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**18. (Currently Amended)** The method of claim 14, further comprising the steps of:

- (f) increasing an amplitude level of said at least one set of said I and Q signals; and
- (g) repeating steps (a) through (d) until said difference error data associated with said at least one set of I and Q signals is less than a second threshold difference level.

**19. (Cancelled)** Apparatus, comprising:

a transmitter, for adapting an encoded data signal according to at least one pre-coded signal, said at least one pre-coded signal being determined with respect to encoded signals from at least one other transmitter, said pre-coder function adapting said encoded signal in response to a pre-coded matrix to produce a pre-coded encoded signal.

**20. (Cancelled)** The apparatus of claim 19, wherein said transmitter further comprises a filtering function, for adapting said pre-coded encoded signal to a transmission channel, said transmission channel tending to impair signals transmitted therethrough.

**21. (Cancelled)** The apparatus of claim 20, further comprising:

a plurality of receivers, for receiving respective transmitted signals from respective transmission channels, each of said receivers determining an impairment level associated with a corresponding transmission channel and propagating impairment indicative data to a corresponding transmitter;

said transmitters adapting respective pre-coder matrices in response to respective channel impairment indicative signals.

**22. (Cancelled)** Apparatus for reducing cross-talk in a communications system comprising a plurality of transmitters for transmitting encoded data signals via respective communications channels, said apparatus comprising:

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a transmitter including a summer for adding a first encoded data signal to at least one pre-coded data signal to produce an output signal, said at least one pre-coded data signal determined according to a respective pre-coding matrix, each of said at least one pre-coding matrices having associated with it a respective encoded data signal;

said transmitter communicating said first pre-coded signal to a respective first communication channel; and

said transmitter modifying said at least one pre-coding matrices in response to an impairment indicative signal in a manner tending to offset channel impairments experienced by said output signal within said first communications channel.

**23. (Currently Amended) Apparatus for reducing cross-talk in a communications system comprising a plurality of transmitters for transmitting encoded data signals via respective communications channels, said apparatus comprising:**

means for processing a first encoded data signal according to at least one pre-coding matrix to produce a first pre-coded signal, each of said at least one pre-coding ~~matrices~~ matrix having associated with it a respective encoded data signal;

means for communicating said first pre-coded signal to a respective first communication channel; and

means for adapting said at least one pre-coding ~~matrices~~ matrix in response to an impairment indicative signal;

said processing tending to offset channel impairments within said first communications channel.